Framing a Supporting Valley

The trick is keeping clean ceiling lines above a vaulted space

BY TIM UHLER

Photos: Tim Uhler

On most of the homes we build, we stick-frame the roof. Often these homes have vaulted ceilings in the master bedroom under two intersecting roofs. The tricky part of this kind of roof is maintaining a vaulted ceiling under the intersecting roofs with clean drywall lines beneath the valleys and intersecting ridge.

In this article, I'll explain how we did this on a recent project using a double-LVL supporting valley rafter.

WHAT IS A SUPPORTING VALLEY?

A conventional valley typically joins at the ridge, where the intersecting roofs are the same height. A *supporting* valley is needed when you have two intersecting roofs with ridges at different heights and no place to post the lower intersecting ridge.

In this case, the main structural valley rafter intersects and is supported by the main ridge beam. This longer, supporting valley rafter carries the lower (minor) ridge and the intersecting (supported) valley **(1)**.

VALLEY GEOMETRY

On this project, we were fortunate that all the roof slopes were 6:12. This makes the geometry very easy. All cheek cuts on the

Full-Scale Layout on Deck

Calculating the Supporting Valley Length

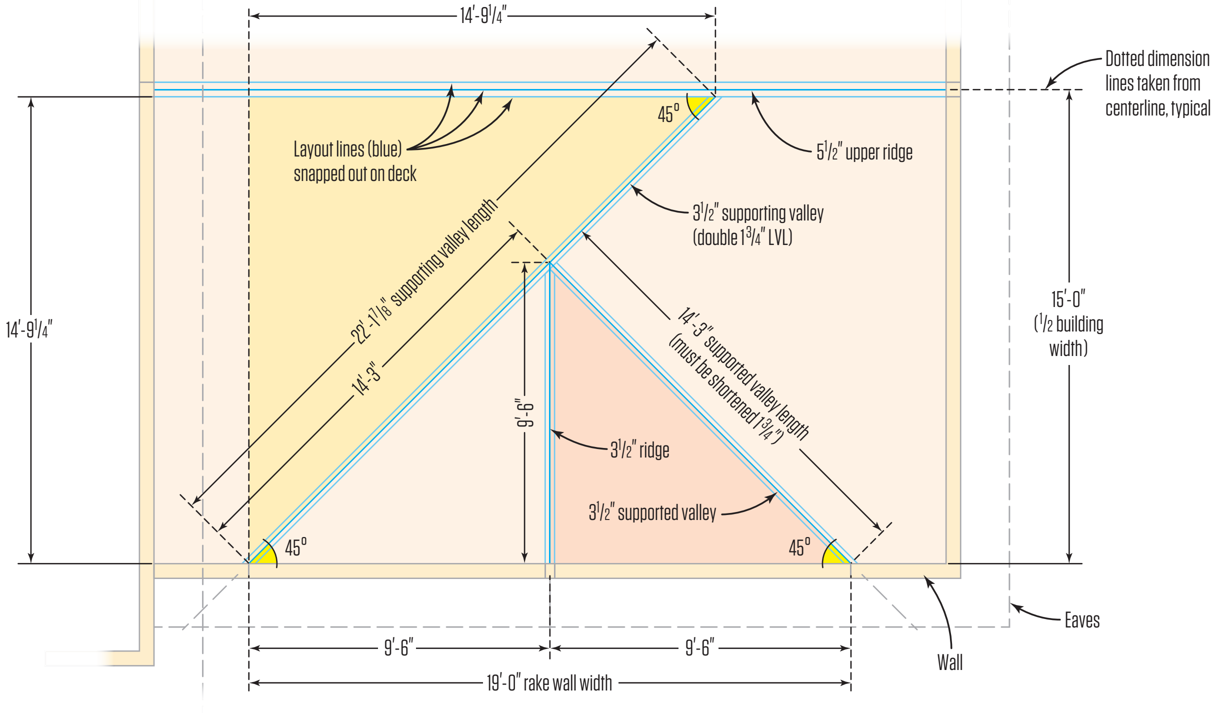
30′ (building width) – 5 1/2″ (ridge width) ÷ 2 = 14′-9 1/4″ (effective run)

14 Foot 9 1/4 Inch Run 6 Inch Pitch Hip/V = 22′-1 7/8″ (supporting valley length)

Calculating the Supported Valley Length

19′ (rake wall width) ÷ 2 = 9′-6″ (effective run)

9 Foot 6 Inch Run 6 Inch Pitch Hip/V = 14′-3″ (supported valley length)



main (supporting) valley rafter and on all the jacks are 45 degrees. The intersecting (supported) valley has a 0-degree (on the saw) cheek cut **(2)**.

Rake-wall support. We frame all our gable walls as rake walls on the deck and lift them (see "Rake Wall Framing," Nov/14). When we lay out the rake wall, we account for the "height above plate" for the rafters, so the top of the rake wall comes to the top of the rafters.

On a larger house, we would need to include posts in the rake wall to directly support the valley rafters. But on this project, the spans were relatively small, so we were able to save a lot of time by adding extra studs to the rake walls where the valleys intersected the wall to create full-height structural columns. We then fastened the valleys to the face of these columns using FastenMaster Timber-Lok screws **(3)**. The screws will be loaded in shear instead of having the valleys bear on posts in the rake wall.

Full-scale valley layout. We began the layout for the supporting valley from the inside of the wall. The simplest way to lay out the geometry is to snap out each framing member on the floor at the time the rest of the layout is snapped. This makes it easier to visualize and even calculate the valleys.

We first snapped out the center and outsides of the upper ridge that the supporting valley will connect to (see Full-Scale Layout on Deck, above).

Because the roof slopes are the same, the supporting valley intersects the main ridge and the gable-end wall at 45-degree angles. This valley will be a double 1 ¾-inch LVL. We snap parallel lines forming the outside edges of the valley, then snap out the lower ridge lines, and then the supported valley.

Once this is all done, it is very easy to visualize how to cut the valleys as well as figure the lengths of each member.

CALCULATING SUPPORTING VALLEY LENGTH

Because the supporting valley connects to the face of the ridge and the face of the gable-end wall, I can use room width (plate to plate), instead of building span, to calculate the length.

Calculate run. To find the run of the valley, I take the room width, subtract the full width of the ridge, and divide by two as shown in the illustration (above). The resulting number—14 feet 9 ¼ inches—is the effective "run" needed to figure the valley


1


2


3

length, as well as the common rafter length for this part of the roof.

Calculate valley length. I can use the effective run to calculate the ridge as follows:

14 FOOT 9 ¼ INCH RUN 6 INCH PITCH HIP/V = 22'1 ⅞"

This is the length along the center of the supporting valley.

CALCULATING SUPPORTED VALLEY LENGTH

To calculate the length of the supported valley, I again work from the full-scale layout as shown in the illustration.

Calculate run. I divide the width of the rake wall—19 feet—by two to get 9 feet 6 inches. This is the run to the center of the ridge for the lower, intersecting roof.

Calculate valley length. Using this run, I use the same calculation with the Construction Master:

9 FOOT 6 INCH RUN 6 INCH PITCH HIP/V= 14'3"

This is the length of the supported valley to the *center* of the supporting valley.

To get the actual length, however, I need to subtract some length so the supported valley butts to the outside face, not the center, of the supporting valley. This is an easy calculation because the smaller (supported) valley butts the longer (supporting) valley at 90 degrees. All I need to do is subtract one ply of the double LVL (1¾ inches) along the top edge, draw a plumb cut, and cut that line.

BACKING THE VALLEYS

To ensure that the sheathing on top and the drywall ceiling on the bottom would plane into the valleys correctly, we had to bevel the edges of the valley rafters and the intersecting ridge. To figure these backing bevels, I just take the arc tan (inverse of sine) of the valley angle. In this case, I can use my Construction Master Trig, as shown in "Backing the Valleys" on page 45, to get a backing angle of 18.4 degrees.

I need to figure out where I need to bevel the valleys using this angle. The configuration will be different in the valley area (below the intersection with the minor ridge) than it is above the intersection on the supporting valley where the valley just has to follow the pitch of the main roof.

I have already calculated the length (14 feet 3 inches) to the intersection along the supporting valley, so I lay that out on the valley. Along this length (the portion of the

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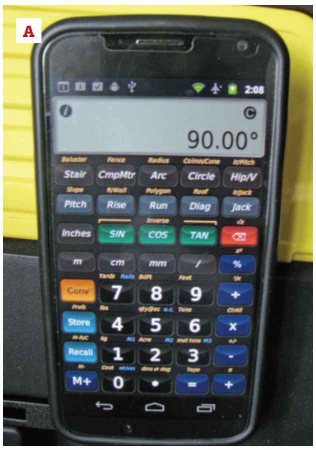
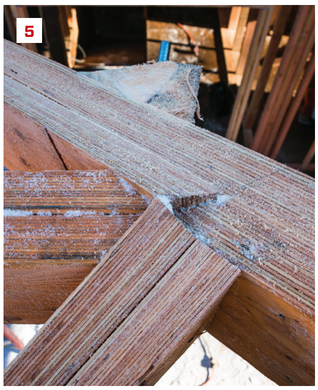
APPS FOR CALCULATING ROOFS

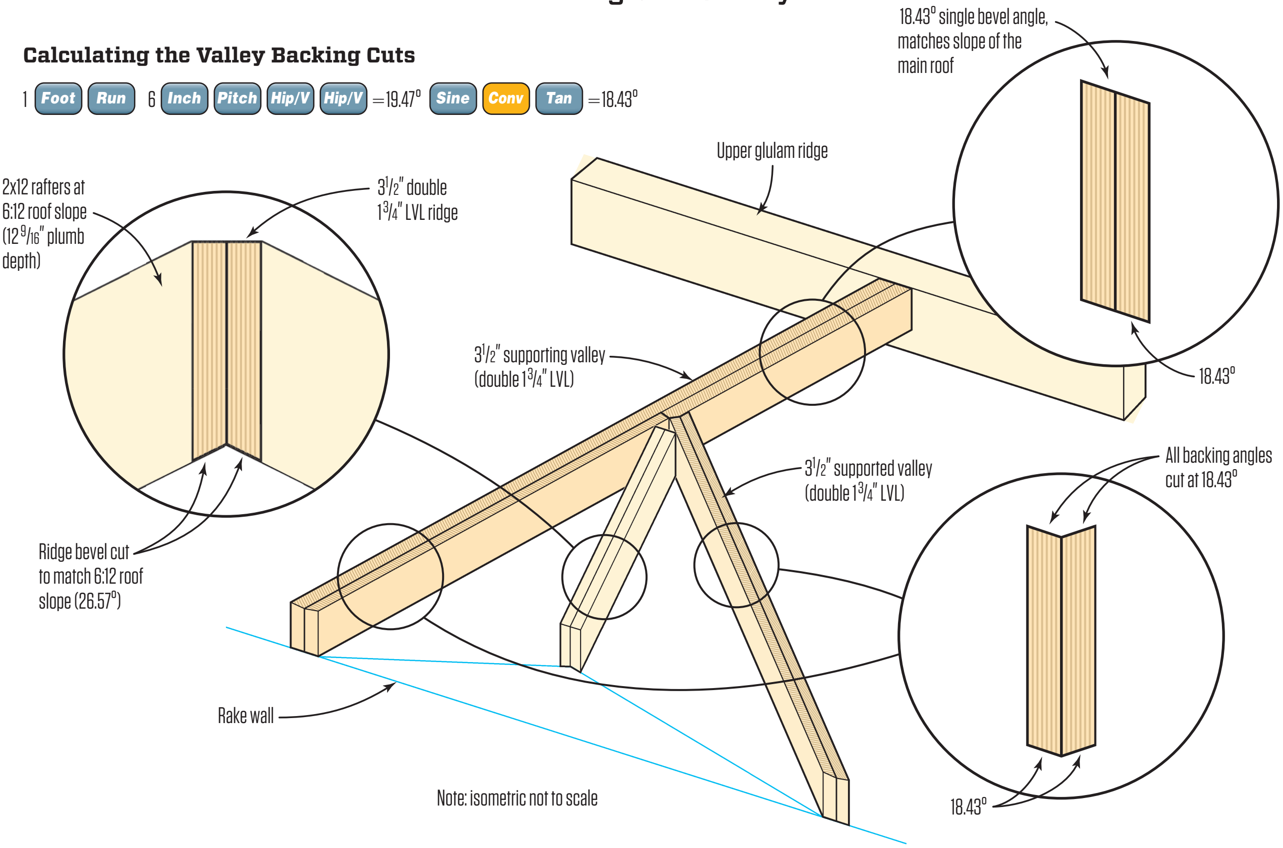
The calculations I show in this article were done with a Construction Master Pro Trig from Calculated Industries. A great alternative is the BuildCalc app **(A)**, which sells for $10. I keep it on my Android phone, and it's also available for iPhones. I can enter the same information and it'll calculate all the angles.

On more complex roofs, especially for split-pitch and irregular-pitch roofs, I also use Sim Ayer's Rafter Tools app **(B)** (available for about $8 for both Android and iPhone).





Backing the Valleys



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valley below the intersection), the "sharp of the bevel" is along the outside of both valleys, sloping toward the centerline along the top edge, creating a "V" in section, as shown in the illustration above. Along the top edge, the "short point of the bevel" is on the outside edges, forming an inverted-V along the bottom (drywall) edge.

These bevels carry all the way to the main ridge on the outer ply of the double-LVL supporting valley ridge. For the inside ply of the supporting valley, there is a triangular "step" at the intersection where the bevel reverses direction **(4)**.

Because I want to bevel the bottom of the valley too, I need to know what width to rip it. I take a 6:12 angle on a 2x12, since we are using this size common rafter. This gives me about a 12 9/16-inch plumb depth on a 2x12 rafter. I just measure 12 9/16 inches along the plumb cut of the valley to make the valley the same depth as the common rafters.

For this roof, we chose to drop the intersecting (minor) ridge **(5)**, and bevel the bottom edge to allow for a nice clean drywall line **(6)**. This bevel is a simple 6:12 angle (26.57 degrees).

STACKING THE ROOF

The order we assemble this roof is: 1) main ridge, 2) supporting valley, 3) supported valley, 4) minor ridge, 5) infill jacks.

Depending on the design approved by the engineer, fastening the valleys and lower ridge can be a hassle. As mentioned, we used TimberLok screws to secure the valleys to the face of the main ridge and to column studs in the rake walls. At the intersection of the valleys and the minor ridge, we ran 5/8-inch threaded rod and used bearing plates to spread the load over 6-by blocks cut at 45 degrees **(7)**.

At times, the valley members for the supporting valley might need three LVL plies. What I like to do is ask the engineer to design it for two-ply and if the depth needs to be deeper than the cut depth of the rafter material, we skip beveling the bottom of the valley and deliberately make sure that the valley hangs below the ceiling lines. We then install blocks between jacks ripped to the valley backing bevel to provide drywall backing. Sometimes we'll add a 2x4 to the bottom of the valley to make it easier on the drywall crew and provide a nice crisp line.

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